the living world. Because biological knowledge was delivered to us in tight compartments, it is very difficult to reconstruct a unified science of biology. But such a science is possible and such a science, perhaps far from the perfection we desire, is being taught by many former zoologists and botanists who are becoming biologists. The process is not easy. It requires a thorough reeducation of the teacher. It may require new knowledge from unfamiliar fields; it demands a reassessment of values appropriate to new objectives; it means the discarding of some cherished "fundamentals" and the adoption of new ones; it may call for a rearrangement of topics and materials; and it may well suggest the exploration of new methods and techniques.

Admitting that some of the courses in general biology have been, as Dr. Shull declares, "a fraud against the student" and that many are not well unified, which are criticisms that might reasonably be directed towards other subjects, I am not ready to accept the dictum of Dr. Shull that biology is non-existent nor the pronouncements of others with whom biology is in disfavor. I think it will be found that courses in botany and zoology, on which Dr. Shull places his *nihil obstat,* are frequently no more unified than the worst of the biology courses.

It is true that the "existence of the word 'biology' does not mean that there is a well-unified science which can be so designated," but my own experience and that of others leave me with a strong conviction that much progress has been made towards unification and that " a better day will dawn" for the teaching of biological science as a result of the continued efforts of the general biologists to construct a unified course in biology.

As scientists, however, we should not be content to judge the merits of biology solely on the basis of opinions, pro and con. The opposing groups may have quite different objectives in mind, and we must first decide what we expect to accomplish by teaching the biological sciences. What I have in mind may differ from the ideas of other proponents of general biology. Even if we can agree on general objectives, it should be patent that subjective opinion for or against biology is not a sound basis for a final decision. Both hypotheses can and must be tested by properly planned and conducted educational experimentation before we can know whether we are accomplishing what we desire.

If I may be permitted to add a personal note, I should like to explain that I embarked unwillingly on the teaching of biology with ideas that were quite in agreement with those of Dr. Shull. In spite of early antagonisms which had been strongly conditioned as a result of my own specialized training, I have come to an entirely opposite opinion and a firm conviction that general biology courses merit the continued support of their adherents and greater tolerance on the part of those who oppose them.

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"HORSE SERUM" A COMPOUND WORD

THE discussion of "horse serum" has already reached considerable length, but it may be permissible to make one more point—namely, that every one concerned has misinterpreted the nature of the disputed phrase. It is not a case of one noun being used as an adjective to modify another; it is a compound noun, exactly analogous to such Greek compounds as thermometer. The first member takes the place, not of an adjective, but of a phrase. "Horse serum" is serum from a horse; "fence post" is post of a fence; "rat poison" is poison for rats. Thermometer, if its first member were adjectival, would mean a "hot meter," not a measure of heat. In most such cases, the compound has a special and definite meaning, not conveyed by an adjective and noun. Had this been understood, neither the original editorial faux pas nor the resultant burst of argument need have occurred. The author (or, if he forgot it, the editor) would merely have inserted a hyphen between "horse" and "serum" and all would have been well.

That the situation was not understood is partly because, though the use of compounds in place of prepositional or other phrases in English has increased in recent years by leaps and bounds, we have not yet developed a consistent or in any way adequate orthography for indicating them. This is admirably illustrated by the playful contributor who wrote "horse sense" and "horse-laugh" in the same sentence. The makers of the Century Dictionary perceived the usefulness of the hyphen as an indicator, but few have followed them. So long as we offend the verities by writing compounds as separate words—which they are not—we shall have confusion and wrangles like the present.

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CONCERNING THE RATE OF EVAPORATION OF WATER THROUGH ORIENTED MONOLAYERS ON WATER

I HAVE read with the greatest interest the monograph on "Surface Chemistry" just published by the American Association for the Advancement of Science. The excellent foreword by Dr. Moulton, emphasizing the importance of this new branch of science, reminded me of the man who, I think, can rightly be considered as the founder of this science, my old and

esteemed friend, Professor Henry Devaux, of Bordeaux (France), who was the first to demonstrate clearly the existence of monomolecular layers at the surface of water. Dr. Langmuir, in his fundamental paper,[1] gave him full credit for this pioneer work, and described his experiments as "beautiful in their simplicity."

Professor Devaux, who is very old now, was still working on monolayers, under particularly difficult conditions, when I left France in August, 1942.

I should also like to mention the fact that, to my knowledge, I published the first paper on the influence, on the rate of evaporation of water, of a monolayer of oriented molecules. This paper undoubtedly escaped the attention of Dr. Langmuir, as it was printed in the *Journal of Experimental Medicine*[2] under the misleading title, "Further evidence indicating the existence of a superficial polarized layer of molecules at certain dilutions" (solutions of serum).

I reported a definite slowing up of the rate of evaporation, but my method was crude in comparison with that employed by Drs. Langmuir and Schaefer.

P. LECOMTE DU NOUY

SCIENTIFIC BOOKS

BOTANICAL BOOKS

The Succulent Euphorbieae (Southern Africa). By ALAIN WHITE, R. ALLEN DYER and BOYD L. SLOANE. 2 vols. xv + 990 + 11 + 11 pp. 1,102 figs. + 25 plates. Pasadena, Calif.: Abbey Garden Press. 1941. $12.00.

EVERY scholar has a dream of books that he would like to write if the fates but smiled. The authors of "The Succulent Euphorbieae" may be congratulated, not merely on the broad vision of their undertaking, but also on the splendid way in which their dream has been realized.

In the introduction we are told that the family Euphorbiaceae includes more than 250 genera and 6,000 species; this family is divided into a number of tribes, of which the largest is the Euphorbieae, "and it is with a part of this tribe alone that the present book deals." The largest genus of the tribe by far is *Euphorbia,* and this, *Monadenium* and *Synadenium* are the three genera considered in the present work, which is restricted to "what may somewhat indefinitely be called the succulent Euphorbias of southern Africa."

The introduction is devoted partly to a discussion of the peculiar inflorescence of this group—the cyathium—and to a consideration of the pistillate and staminate flowers of which it is constituted. The vegetative characters, with their great multiplicity of form, are next taken up, and their striking similarity in many cases to the Cacti, to which they are entirely unrelated, either phylogenetically or geographically, is pointed out; in spite of the vegetative variability, the relatively uniform structure of the cyathium has been maintained. The last part of the introduction is devoted to a historical discussion of the group.

There are keys to the above-mentioned three genera, and then to 193 species of the genus *Euphorbia.* Each of these species is subsequently taken up in very considerable detail, with complete descriptions of the plant, the spines, the leaves, the inflorescence and the capsules. Next follow type locality and distribution. After these formal accounts, in each case there is a discussion of history, relationships, growth habits, geographical occurrence, etc. These informal presentations are prepared in delightful style and give the volumes life and charm. Two species of *Monadenium* and two of *Synadenium* are similarly considered.

The first Appendix, A, lists the new species, varieties and combinations proposed in the book and gives Latin descriptions when necessary. In all, thirteen new species, fifteen new varieties, seven new combinations and one change of name are offered. A glossary, bibliography, discussion of five undetermined species and "Notes on Euphorbia Culture" conclude these volumes.

One of the most striking features of this work is the illustrations. In all, one hundred and ninety-seven species are described, and there are more than eleven hundred figures, including seventy in the introduction. Most of the species, therefore, are illustrated by a number of figures. In addition, there are twenty-five plates in full color.

Even if you are among the uninitiated, you can turn through these pages and gain a conception of what this group is like from the illustrations. And if you do, you will read some of the accounts, and you will be impressed by the polish, and in some instances by the quaintness, with which they are presented.

"The Succulent Euphorbieae" is a monument, of which the authors may well be proud.

The Carnivorous Plants. By FRANCIS ERNEST LLOYD. xvi + 352 pp. 11 figs. + 38 plates. Waltham, Mass.: Chronica Botanica Company. 1942. $6.00.

ALTHOUGH other accounts of carnivorous and in-

[1] *Jour. Am. Chem. Soc.,* 39: 1848, 1917.

[2] Vol. 39, p. 717, 1924.